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United States
Department of
Agriculture

Forest Service
Southern Region

MANAGEMENT OF SOUTHERN PINE FORESTS FOR CATTLE PRODUCTION

General Report R8-GR 4
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INTRODUCTION

Longleaf-slash and loblolly-shortleaf pine types occur on over 63 million acres of southern pine forests. Overall, timber is the main crop on these lands, but through coordination of management practices, landowners also produce other products and benefits such as forage for livestock, wildlife, recreation opportunities, and water.

Management expertise is needed to assure protection and enhancement of all resources in which the owner or manager and the public have interest. Several Federal and State agencies offer technical assistance and information, and in many localities consultants are also available to help plan and implement management programs.

Successful cattle production requires that managers understand the production characteristics of forage, livestock, and timber. This booklet provides general information on forest land grazing and management of southern pine timber. It also includes advice on how to determine opportunities and coordinate management of forest and related resources for production of beef cattle on forested range.

CURRENT SITUATION

The management and use of southern forest for grazing has changed drastically over the past 30 years. Although the area being grazed has declined, forage and livestock resources are being better managed. Cattle grazing occurs, to some degree, throughout the southern pine area, but most grazing is found within the longleaf-slash pine type in Texas, Louisiana, Mississippi, Alabama, Florida, and Georgia. Substantial numbers of livestock also graze forage associated with the loblolly-shortleaf pine type, particularly in southeastern Oklahoma and Arkansas.

The South is a major timber-producing region, but markets for nontimber products provide opportunities for intensive, integrated resource management. Areas where prescribed burning and thinning of timber stands are commonly practiced have proven to be best suited for combined timber and livestock production.

Trends in the management and production of livestock are strongly affected by cattle, land, and labor prices. When cattle prices rise, greater interest is shown in using forest forage for livestock production. On the other hand, rising labor and land costs force some owners to sell out or cease to make the needed investments for production of livestock on forested lands. Many rural residents have full or part-time jobs off the farm which compete with the time needed to maintain improvements and manage livestock.

The trend in Alabama, north Florida, and Georgia is to use forested range for cattle only in the spring and summer. Fall and winter grazing occurs on row crop residues, improved pastures, or winter grains. In south Florida, a common practice is to use forested range during the winter and depend on improved pasture during the spring and summer.

Seasonal or yearlong supplementation with improved pasture grasses seeded on utility and road right-of-ways, firebreaks, or small conventional pastures, is practiced in many areas of the South. However, the cost of fencing and other improvements requires investors to carefully plan beef cattle operations to most efficiently use all resources and investments. Therefore, management becomes more complex, requiring better planning and knowledge.

Almost all livestock income from southern forested range is made by producing and selling calves as the cash crop (figure 1). Beef cattle research has tested and developed good breeding programs for these cow-calf operations. In the past, controlled breeding of livestock was done by only a few operators. Today many are carefully planning this aspect of their operations in order to produce uniform crops of calves.

FIGURE 1. — Most livestock income from southern forested range comes from producing and selling calves as a cash crop.

Forage management is the weakest link in current forest grazing operations. Research findings provide adequate information for operators managing both livestock and forage to achieve better results, but good forage management seems to be difficult to understand and adopt. Progressive livestock managers have found supplementation of

forest forage to be necessary to produce acceptable calf crops. Without proper supplementation, calf crops are frequently below 50 percent. Proper animal supplementation helps improve calf crop production, and weaning weights of over 400 lbs. can be expected.

Forest management, as practiced in the Coastal Plains, has changed significantly in the past two decades. Forest industry has generally shortened timber rotations, thus creating open-forest conditions more frequently. In 25-year rotations, all trees on an area are removed every 25 years, and open conditions, conducive to best grass production, may last from 5 to 12 years. Today, some commonly-used wide spacings allow good forage production for the first 15 years of the rotation; then a thinning results in maintaining grazing throughout the rotation.

To combine timber and cattle production, landowners commonly apply management practices designed to enhance or protect each resource. National Forests continue to maintain livestock grazing as a part of multiple-use management in most states of the southern pine area.

While wood-using industries own only about 19 percent or 38 million acres of commercial forest lands in the South, much of this land is in blocks large enough to effectively manage for timber, livestock, and other products. However, not much of this land is being grazed. Nonindustrial, private ownership makes up 73 percent or 145 million acres, and most forest grazing occurs on these small private lands. These two types of ownerships have the best opportunities for increasing cattle production in conjunction with timber production.

As land taxation rates increase, industrial and nonindustrial owners look for additional ways to increase income. Multi-resource management of forest land is one option (figure 2). One Georgia farmer who owns forest, pasture, and cropland, leases his forest lands for quail and deer hunting, grazes cattle on forest forage from March through September, and lets cattle forage on harvested cornfields and graze winter cover crops until spring. To do this, he manages timber to complement forage production. This multi-resource approach provides an annual income from livestock, hunting, and row crops and an economic cushion for times when single-product prices decline.

FIGURE 2. — Industrial and nonindustrial forest landowners are looking for ways to increase income by double cropping.

Timber management—the main use of most forest land—can be modified to protect and enhance forage and wildlife resources. Prescribed fire, often needed to help prevent destructive wild fires, is also being applied by some timber managers to benefit forage production for livestock. Road and utility rights-of-way may be planned and managed for both improved forage grasses and wildlife openings. Fences, roads, and other fixed improvements are designed for multi-resource benefits. Coordination of practices is necessary, not only for increased net income, but also for increased production of goods and services from our limited forest lands.

Prescribed burning has historically been used as a tool for managing southern forests and is particularly needed to help manage forage production for livestock. In recent years, state laws concerning control of air pollution and soil erosion have caused landowners to be particularly careful. Some federal and state legislation require those who use prescribed fire to become more proficient. Federal and State environmental laws require that more attention be given to the protection of soil and water quality. Grazing of livestock, if improperly managed, can cause excessive sedimentation in streams. The Federal Threatened and Endangered Species Act protects both plants and animals that are deemed endangered or threatened, and some states have similar legislation. Landowners and livestock operators should know their responsibilities under such legislation and understand the effects of management practices on the environment.

Rising costs of farm and ranch labor, along with other related factors, have increased the use of labor-saving techniques. Liquid food supplements may replace cottonseed meal or other food supplements, which require frequent visits to each herd. Many owners also allow cattle to have access to small improved pastures interspersed throughout the forest, rather than feed other supplements or hay.

GRAZING OPPORTUNITIES

The total southern forest range area covers about 200 million acres and includes all or portions of a dozen states extending from Virginia into eastern Texas and Oklahoma (figure 3). Some 56 million acres are owned by the public and forest industry while about 145 million acres belong to other private landowners. Throughout the South, there are more than 28 million acres of improved pasture, and many of these are used to supplement seasonal grazing of native range.

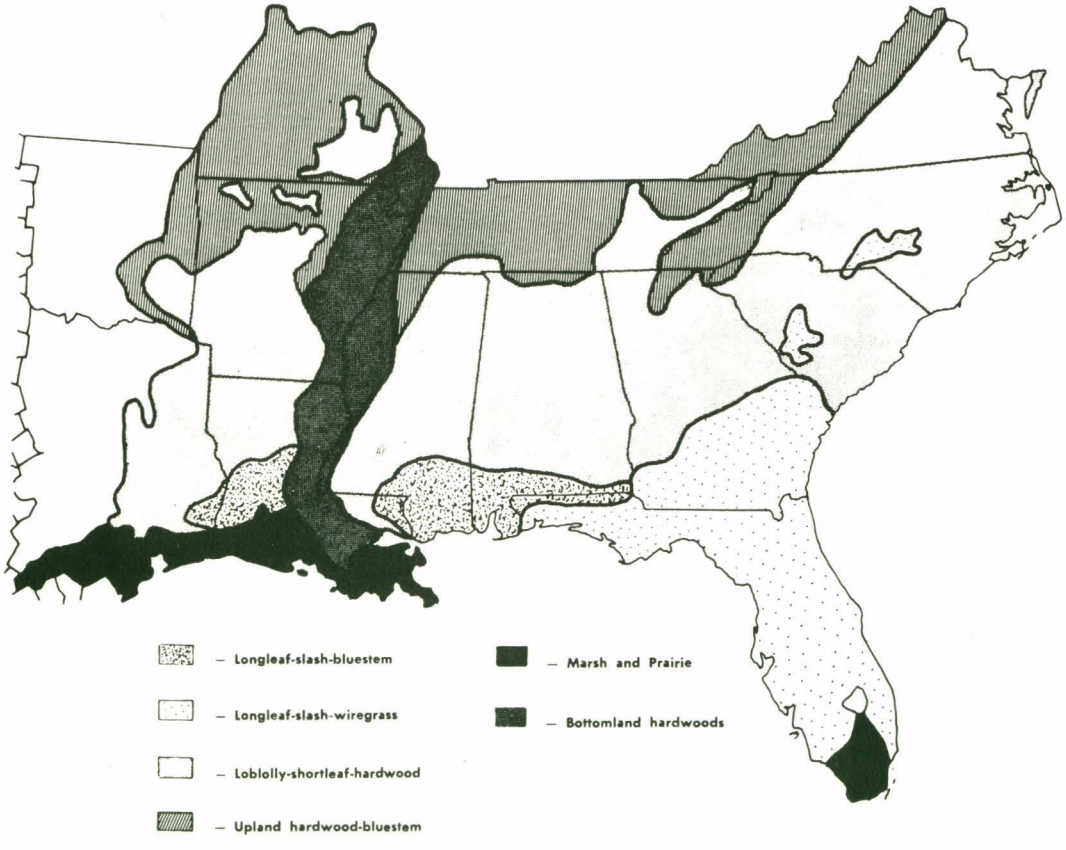

FIGURE 3. — Forest range types of the South.

Environment

The South has the appropriate climate, soil, water, and sunlight necessary to produce large amounts of forage, as well as timber. Abundant and fairly uniform distribution of rainfall is characteristic of the South and desirable for high forage yields. Precipitation varies from 49 to more than 60 inches per year.

Growth and development of forage is 70 percent complete by July, but midseason drought still is very damaging to the resource. Mild winter tempertures contribute to large forage yields. Average January temperatures vary from 35 °F in the northern portion to 70 °F in southern Florida. Average July temperatures are between 80 °F to 85 °F. Most of the area has at least 7 months between killing frosts, while the coastal areas may be frost-free for more than 9 months.

Soils in the South are generally moist to wet, contain low amounts of organic matter, and are frequently low in nutrients required for good plant growth and animal nutrition. Forage potentials are strongly influenced by wide fluctuations in several soil factors including wetness, texture, and fertility.

Forest Types

There are six major forest types in the South: longleaf-slash pine, loblolly-shortleaf pine, oak-pine, oak-hickory, oak-gum-cypress, and elm-ash-cottonwood. These types are defined by their existing or past forest overstory composition. The first four types represent areas most heavily in demand for livestock grazing, while all are considered good wildlife habitat.

The western portion of the longleaf-slash pine type (pine-bluestem range) comprises about 4 to 5 million acres along the Lower Coastal Plain from southeast Texas to the Florida panhandle. Acreage in this type has decreased since 1935, principally due to cessation of fire and invasion of clearcut areas by loblolly and shortleaf pines and hardwoods.

Here, southern waxmyrtle and gallberry are common in the understory. Principal forages include bluestem grasses. Little bluestem and its variety, pinehill bluestem-comprise about one-half of the herbaceous forage. Slender bluestem may be the primary forage species on burned and grazed cutover land. Creeping bluestem is abundant in parts of Alabama and Florida. Composites, the largest group of forbs and legumes, are often abundant.

Recently cutover areas on the average annually produce 2,000 to 3,000 pounds of herbage dry matter per acre. Forage potentials vary between 1,000 and 5,000 pounds per acre, depending on soil and climatic differences.

The eastern portion of the longleaf-slash pine type (pine-wiregrass range) occurs on almost 20 million acres and is characterized by the dominance of pineland threeawn (wiregrass). Bluestem grasses are common, but dominate sites only where the wiregrass has been removed. Other important forage species include paspalums and panicums. Curtiss dropseed is common in south Georgia and north Florida. Many forbs also occur, but legumes are relatively scarce. Common woody understory plants include saw-palmetto, gallberry, and southern waxmyrtle. Neither saw-palmetto nor gallberry provide desirable forage for cattle.

Because wiregrass is palatable for only a 2-to 3-month period following fire, it isn't as desirable as other grasses. Efforts to replace wiregrass with bluestems or other forage grasses have been successful only when wiregrass is mechanically eradicated. In such instances, bluestems often yield about twice the forage produced by wiregrass.

As the canopy closes on young plantations of the longleaf-slash pine types, forage production declines. In young, well-stocked tree stands (10-to 20-year-old) in southern Louisiana, forage yields are reduced by 15 pounds per acre for each square-foot increase of tree basal area. Older stands affect forage yields about one-half that amount. Better forage yields can be sustained in pine stands by wider initial spacing of the trees, by periodic burning as soon as the trees can withstand fire, and by thinning timber.

The loblolly-shortleaf pine-hardwood type (pine-hardwood-bluestem range) comprises the most extensive forest range in the South. Totaling about 50 million acres, this type stretches, almost unbroken, from eastern Texas to northeastern Virginia and varies from 150 to 300 miles wide. Hardwoods commonly found on this type of range include oak, hickory, sweetgum, tupelo, maple, dogwood, and beech. Common shrub and vine species are American beautyberry, yaupon, greenbrier, blueberries, hawthorns, honeysuckle, muscadine grape, and Alabama supplejack. Little and pinehill bluestem are the main grasses in openings and under mature open pine stands, while spikegrasses (uniolas) occur on heavily shaded sites. Initially, forage may exceed 5,000 pounds per acre in young plantations where sites are high in productivity and have been intensively prepared for planting.

The upland hardwood forest types (hardwood-bluestem range) occupy about 46 million acres in Tennessee, Mississippi, Missouri, Arkansas, and Oklahoma. Oaks are the primary tree species, while hickory, gum, sassafras, eastern red cedar, hawthorns, blueberries, greenbrier, grape, and

brambles are often found. Bluestems, indiangrass, and switch grass are important grasses. Depending upon the density of timber overstory, forage production can vary from a low of 30 pounds per acre to more than 4,000 pounds per acre when tree cover is reduced and forages are fertilized. Lack of management in the past has reduced thousands of acres to cull hardwoods. Research is investigating new ways to utilize these low-value trees. Forage potentials may change as timber and other forest resources and values change.

Influences

Tree canopy, timber management, grazing management, and fire greatly influence forage yields. Forage species react differently to various combinations of these factors. Warm season, non-shade-tolerant species predominate under medium to open forest canopies, while cool-season, shade-tolerant species become dominant when the forest canopy becomes dense. In the coastal plains, forage potentials vary from 225 pounds per acre under timber stands on deep sand soils to 4,000 pounds per acre in open timber canopies on sandy-loam soils.

The quality of range forage is judged by protein and mineral contents and digestible energy. Forage quality can be influenced considerably by management techniques such as closeness of grazing, mowing and raking, and prescribed burning. Prescribed burning removes suppressing litter and stimulates vigorous new growth, while grazing or mowing have similar effects in stimulating more palatable nutritious growth. Forage under tree overstories shows increases in protein and phosphorus and decreases in nitrogen-free extract in comparison to cutover, open lands. Crude protein in forage may exceed 7 percent in September under pine stands, while open areas may have less than 5 percent.

Prescribed burning is often used in managing timber, range, and wildlife. Burning reduces fire hazards, controls brownspot disease in longleaf pines, reduces plant competition, increases visability for tree marking and logging, reduces logging slash, topkills brush, reduces litter accumulations, provides early spring forage which is palatable and nutritious, and attracts grazing animals. Burning in early May stimulates height growth in longleaf pine seedlings. Burning rotations of 3-to 4-year intervals appear best for livestock and many species of wildlife.

A few landowners are planting trees on improved pasture for dual crop production. Common management and maintenance practices for these pastures includes fertilization, which generally increases both forage and pine growth. Utilization of forage by livestock in the southern pine area is seldom intense enough to denude the soil or cause serious encroachment of low value herbs. Livestock use may increase forage yields, although species composition can change appreciably. For instance, intense use may decrease a key species such as little bluestem, while carpetgrass or threeawn may increase. However, climatic conditions allow rapid recovery of key species with grazing deferment.

Tree overstory density dramatically affects forage yields; as tree canopy or basal area increases, forage yields decrease (figure 4). Periodic timber thinnings enhance forage production, as does any removal of the overstory. Studies show that heavy precommercial thinning of young, dense direct-seeded stands increases forage by as much as four times. Commercial thinning is also beneficial, since it opens the tree canopy and allows more light to penetrate to the forest floor. Mature timber stands that are regularly thinned and burned produce about half as much forage as treeless areas.

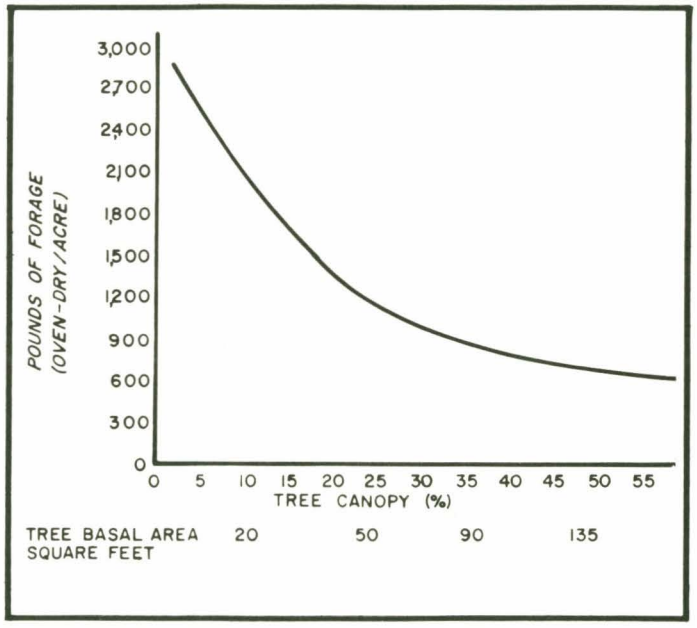

FIGURE 4. — Influence of trees on forage yields.

Clearcutting, especially when followed by mechanical site preparation, has a great impact on forage production. Sometimes the existing forage is destroyed through mechanical disturbance and forage yields are low for a few years. Broadleaf forbs and annual grasses on such areas will quickly cover the land, and a good cover of perennial grasses will usually become established within a 2-to 3-year period.

Forage Quality

Forage is generally most nutritious during spring and summer when the plants are young and rapidly growing (figure 5). During this period, crude protein may exceed 12 percent and is greatly beneficial to grazing animals. Mature dry cows generally gain from 155 to 175 pounds each, although wet cows may gain little, or even lose weight. Nutritive value of forage declines rapidly – often to below 3 percent crude protein – in fall and winter. Even with supplements, cows that calve during the winter may lose 125 pounds or more, and dry cows may lose 50 pounds or more.

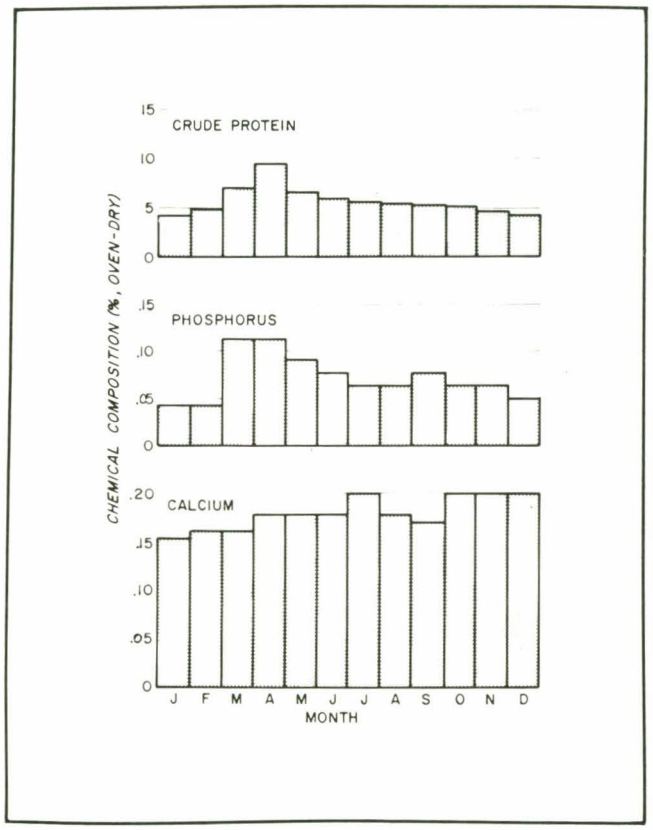

FIGURE 5. – Typical seasonal trends in major nutrients of southern native forage.

Crude Protein. – Protein is essential for growth, weight gains, healthy appetite, milk secretion, and regular estrus in cows. New plant growth is higher in crude protein than mature growth. Consequently, removal of old, mature plant parts through prescribed burning, grazing, or mowing increases the forage quality on bluestem and wiregrass ranges.

Many southern ranges contain forbs and browse (tips of woody twigs and branches) that are higher in crude protein content than the grasses which predominate in cattle diets. Evergreen woody plants and winter growing forbs are favorite winter cattle forages. Regardless of the protein contributed by woody plants, cattle winter diets are often deficient in protein, and animals must be supplemented to meet their minimum requirements.

Phosphorus. – Across the south, the mineral most often deficient in native forage is phosphorus. Phosphorus deficient animals suffer from loss of appetite and reduced rate of gain. Such animals become stiff-jointed, and their bones deteriorate. Milk production and reproductivity of the cows are also impaired.

Phosphorus content usually decreases with plant maturity. Phosphorus in forage is generally higher on recently burned range than on unburned range, and in young growth than mature plants. Phosphorus is lower in grasses than in forbs or browse. Some forbs at times exceed the minimum 0.18 percent phosphorus required by pregnant and lactating cows. Phosphorus content in cattle diets will reach 0.12 to 0.16 percent during spring but is usually below 0.10 percent most of the year. Because of this, phosphorous supplementation of livestock is necessary on forested range.

Calcium. – Calcium is an important mineral for bone-building, growth and reproduction. Most forages and the selected cattle diets exceed the minimum 0.20 percent calcium level thought necessary for breeding cows. Forbs and woody browse are usually even higher in calcium content than grasses.

Cobalt and Copper. – A deficiency of cobalt or copper may cause loss of condition, stunted growth, diarrhea, and anemia in cattle. Both minerals are likely to be deficient in the wiregrass type in Florida. In Georgia, commonly grazed forage is low in cobalt and borderline in copper. Cobalt deficits are thought to be balanced through use of browse plants high in cobalt, such as blackgum. Copper is high in plants such as saw-palmetto. Cobalt and copper appear adequate in the bluestem type of the west and central Coastal Plain, since cattle generally show no deficiency symptoms, even during winter.

Energy. – Digestible energy is an important component of the cattle diet relative to animal production. Range forages used by cattle are generally highest in the spring, when rapid vegetative growth occurs. As plant growth slows, digestible energy of forages is usually not sufficient for cattle maintenance and growth. This generally is the case from late fall through winter. Cottonseed meal, hay, grain, and winter pasture supplements can be used to alleviate these native range deficiencies.

DETERMINING GRAZING CAPABILITIES

Forage production is probably the most important information needed by landowners considering using woodlands for grazing. Determination of palatable and available forage yields allows the establishment of a sound, basic grazing program which also protects forest resources from damage. Without this basic information, the forage resource could be underused. Even worse, it could be overused damaging grazing opportunities along with wildlife habitat, young trees, and watersheds.

Planning the Inventory

The first step in measuring a forage resource is identifying the areas within an ownership that are suitable and unsuitable for grazing. Suitable range will usually be upland areas with a good stand of grasses and forbs. Several situations can cause an area to be unsuitable, such as: (1) no forage, or too little forage; (2) swampy or extremely wet conditions that prevent accessibility to cattle; and (3) reserved uses not compatible with cattle, such as recreation (picnic and camping) or a watershed for domestic water supplies.

These suitability determinations should be identified on a map or, preferably, on an aerial photograph. Boundaries of each suitable portion should be mapped as accurately as possible. It's also helpful to identify the forest type or dominant vegetation and its condition. A fairly accurate map should be made from the aerial photo or master map for field use. This is needed to help keep the range examiner oriented properly while tallying the plots and provides a permanent record of the approximate location of sample plots or line of plots. Such records are valuable when planning additional forage surveys.

The next step is determining the number of acres that have been delineated as suitable range (figure 6). This can be done using a dot grid or planimeter. These acreages should be permanently recorded on the master map.

Equipment

Grass Clippers. — Vegetation can be cut with a pocket knife, butcher knife, or sheep shears, but standard grass clippers are best because they are safe to use, easy to transport, and relatively inexpensive. The scissors type (direct action), with handles that move horizontally, are best for long periods of use and are recommended when forage is being separated by species at the time of clipping. Battery-powered clippers are suitable when all vegetation is being removed together.

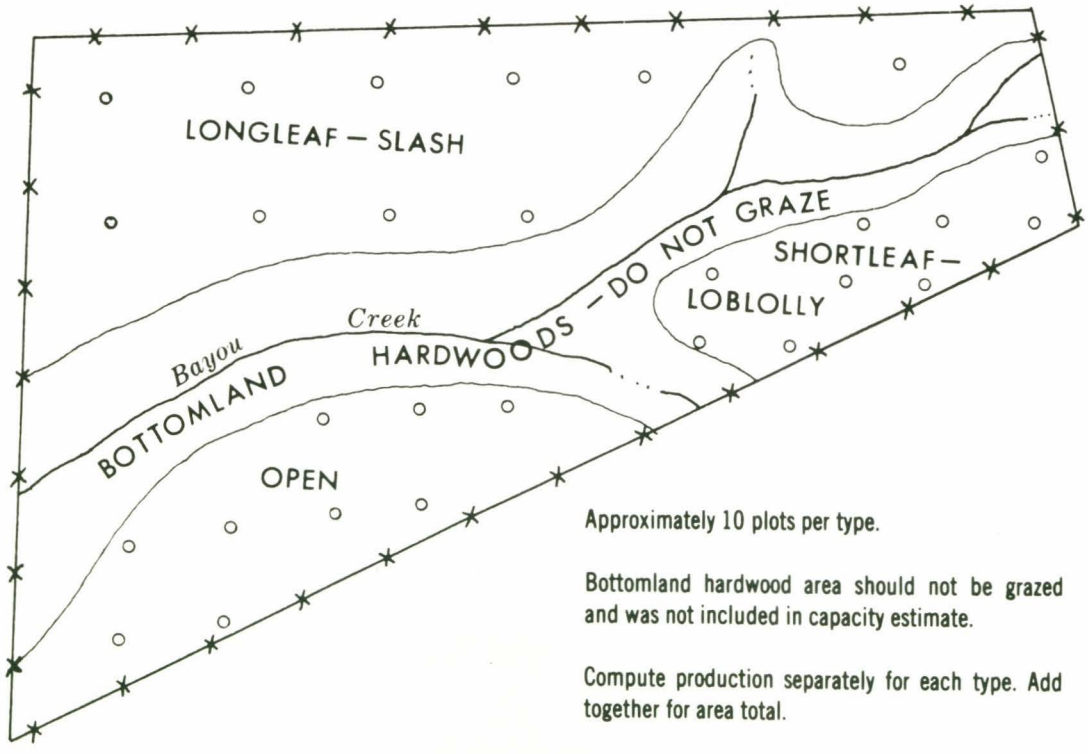

FIGURE 6. — The above sketch shows how each area may be delineated to show suitable range.

Paper Bags.—Grocery bags are needed to hold clipped vegetation for weighing and determining nutrient levels or conversion factors for dry-weight yields. The 20-pound bag is usually a good size, but if the vegetation is extremely dense, a larger bag removes the need for weighing more than one sample from a plot. The weight of bags should be subtracted from the total weight.

Plot Markers.—An area of specific size must be clipped or estimated to determine yields. A plot containing 9.6 square feet has been adopted because of the ease in converting weight in grams to pounds per acre (gram x 10). The plot can be a square of 3.1 x 3.1 feet or circular with a circumference of 10.96 feet and a diameter of 42 inches. Wire circles or rectangular metal or wooden frames can be used to make a measuring device.

Weighing Scales.—A spring scale weighing in grams is needed to obtain accurate weights. Scales calibrated in 2-gram, 5-gram, or 1/4-ounce increments are easily read and transported.

If scales measuring in ounces are used, a rough conversion can be made as follows: One ounce equals 28 grams; each gram of vegetation from a 9.6 square foot plot represents 10 pounds of forage per acre. Therefore, 5 ounces of clipped vegetation will represent 1,400 pounds per acre. From that point add or subtract 300 pounds per acre for each ounce above or below 5 ounces. The exact amount would be 280 pounds per acre, but the 300 figure is easier to use and should be close enough. If scales graduated in 1/4 ounces are used, allow 70 pounds of forage per acre for each 1/4 ounce.

Maps.—A fairly accurate map should be made from the aerial photo or master map for field use. This is needed to help keep the range examiner oriented properly while tallying the plots and provides a permanent record of the approximate location of sample plots or line of plots. Such records are valuable when planning additional forage surveys.

Permanent Records.—A permanent record should be made of all collected data and identified species. Forage weight from each plot should be recorded for later summary and determining grazing capacity. Other observations—identifying major plant species, plant vigor, amount of bare ground, or signs of erosion—can be very valuable in determining a grazing program. These records are indispensable when evaluating success or making adjustments at a later time.

Conducting the Inventory

Field collection of annual yields can be accomplished after growth ceases in the fall. Steps necessary to measure forage yields include selecting sampling areas, establishing plots, determining forage weights, and calculating yields from information gathered.

Selecting Sampling Areas.—Use the map to group each area of suitable range into similar types or conditions of vegetation. Determine the number of plots needed to obtain an adequate sample, and distribute them throughout each type defined. Use an unbiased method to determine where the actual plot is located. A rule-of-thumb is: Determine yields on 10 plots in types containing 200 or more acres, and at least 5 plots in types containing 100 acres or less.

Establishing Plots.—Settle the plot marker into the vegetation and clearly establish the border of the plot. Only vegetation within the plot is used to determine yield. The plot should be raked by hand before clipping to remove pine needles and dead herbage.

Determining Forage Weights.—Either estimate the amount or clip all herbaceous vegetation at ground level (figure 7). Place the clipped material in a paper bag and weigh the herbage in grams. Subtract the bag weight from the total.

FIGURE 7. — Forage yields and proper grazing use can be estimated by clipping forage from a series of small plots.

Calculating Yields.—Enter the herbage weight per plot on the permanent record sheet. Empty the bags, gather up all equipment, and proceed to the next plot. After all plots have been clipped, add the weights of all plots within a strata and obtain the average weight per plot for that strata. Convert green weights to a dry weight basis by multiplying green weight by: (1) 0.40 if clipped in the late spring; (2) 0.50 if clipped in the summer; (3) 0.60 if clipped in the fall; and (4) 0.80 if clipped in the winter. Then multiply the results in grams by 10 when using 9.6 square foot plot to obtain average

yield in pounds per acre. Finally, multiply dry-weight yield per acre times the number of acres in the strata to determine the amount of *available forage*. Add *available forage* in each strata of the grazing unit to obtain *"total available forage"* that can be grazed. If a certain percentage is to be allocated for wildlife, this amount should be deducted before determining the carrying capacity for livestock.

Carrying Capacity

Initial Stocking Rate. – The proper number of animals for a unit is dependent on a number of variables. The length of use can be yearlong or seasonal. The degree of use is especially important since a high degree (60 percent or more) gives maximum returns per acre but can cause the resource to deteriorate. A low degree (35 percent or less) gives maximum returns per animal, but underutilizes the resource (wasted forage). A medium degree of use (40 to 50 percent) gives a good return while causing no harm to the resource. The type of grazing system to be used is also important in determining the number of animals, since in some systems, more animals can be concentrated on a small area for a short period. The deciding factor is the yield of forage and the animal units of grazing this yield will support.

To calculate a conservative *initial* stocking rate of livestock for grazing only in the forage growing season, use the following procedure: *Take the total available forage for the entire tract* and divide by 2,250. This will give you the total months of animal use available. If yearlong grazing is planned, use 3,000 instead of 2,250 to determine initial stocking. An estimate of carrying capacity for specific grazing periods is shown in table 1.

TABLE 1. – Acres per cow by 3- to 12-month grazing periods.

	Months of grazing				
Grass production	3	5	7	9	12
(Dry wt. lbs/acre)	*(Acres per cow)*				
500	14	23	32	41	72
1,000	7	11	16	20	36
2,000	3	6	8	10	18
3,000	2	4	5	7	12

Adjusting Stocking Rates. – During the first few years of grazing, annual evaluations should be made to determine if the stocking rate is too high or too low. This is particularly important if initial measurements were made in an unusually wet or dry year. Thereafter, the stocking rate should be evaluated periodically as conditions change.

The best way to evaluate stocking rates is by measuring forage yields and use. If yields and actual use are as anticipated, no adjustments are needed. Adjustments will usually be required as trees grow larger, because forage yields decrease as the canopy closes and shade increases.

Utilization can be estimated by having a few ungrazed enclosed plots in typical situations to compare with forage remaining outside in the grazed portion (figure 8). Some of these small, movable enclosures should be placed in recently burned range. They can easily be made by using 3 or 4 steel fence posts and wrapping wire fencing around them.

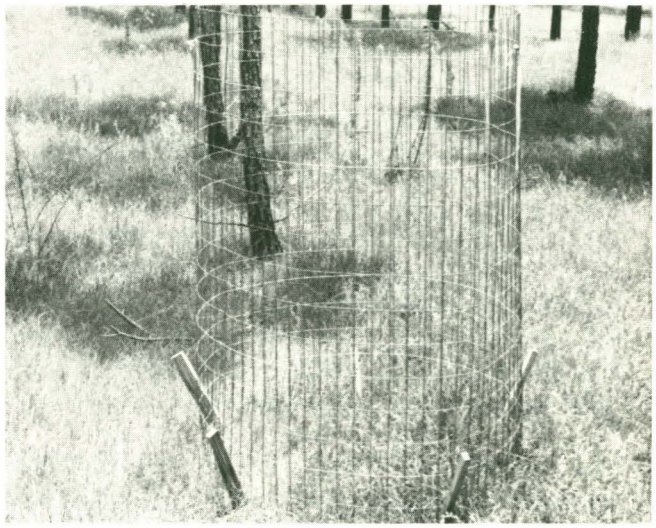

FIGURE 8. – Utilization of forage can be determined by comparing the forage inside the ungrazed plot with forage on the grazed portion.

Needed adjustments to stocking rates can also be determined by observing cow and calf weights, although it is more difficult to detect trends in animal weights than to measure forage yields and use. Cows should maintain or gain some weight each year. Trends in cow weights from year to year will usually indicate if forage is insufficient.

A need to reduce cattle numbers can be lessened by thinning trees more heavily or frequently. Productive forage conditions persist if basal areas are maintained between 60 to 100 square feet per acre. The primary objectives of management and the end product will determine what adjustments and trade-offs are most desirable.

MANAGEMENT OF NATIVE FORAGE

Major Species or Groups of Species

Table 2 lists the principal forage plants, along with their prevalence, site preference, and season of greatest use by cattle. Range forage plants are commonly divided into four groups: grasses, grasslikes, forbs (broad-leaved herbs), and shrubs (woody plants). A good variety of forage helps balance the cattle diet, and a mixture of warm- and cool-season plants lengthens the availability of green feed. Equally important as the season, however, is the quality of the forage.

TABLE 2. — Principal forage plants in the longleaf-slash pine forest range.

Species	*Prevalence*[1]	*Site preference*	*Season of greatest use*
GRASSES:			
Big bluestem	*Scattered*	*Moist to dry sandy soils*	*Summer and fall*
Carpetgrass	*Common*	*Moist ground, roadsides,*	*Spring and summer*
Creeping bluestem	*Abundant. Alabama eastward*	*Moist to dry sandy soils*	*Summer*
Curtiss dropseed	*Abundant in flatwoods of Georgia. Florida, and South Carolina*	*Moist to dry sandy soils*	*Late fall and winter*
Cutthroat grass	*Scattered in central Florida*	*Sandy soils or swamps*	*Spring and summer*
Giant cane	*Scattered*	*Low moist areas and alluvial soils along streams*	*Summer*
Goobergrass	*Scattered in South Carolina & Florida*	*Low moist sites*	*Summer*
Little bluestem	*Scattered*	*Moist to dry sandy soils*	*Spring and summer*
Lopside Indiangras	*Mostly in East*	*Moist to dry sandy soils*	*Summer and fall*
Maidencane	*Common near coast*	*Marshes and wet sites in pine forests*	*Winter*
Panicums	*Abundant*	*All sites*	*Late winter and early spring*
Paspalum	*Common*	*All sites*	*Spring and summer*
Pinehill bluestem	*Abundant from Mississippi to Texas*	*Well-drained slopes and sandy ridges*	*Spring and summer, but some all year*
Pineland threeawn	*Abundant Mississippi eastward*	*Moist to dry sandy soils*	*Late winter and early spring*
Pineywoods dropseed	*Common*	*All except wet sites*	*Spring*
Slender bluestem	*Abundant*	*All except wet places*	*Spring, early summer*
Spikegrass	*Abundant in dense forest stands*	*Moist sites*	*All year*
Switchgrass	*Common*	*Moist areas and along streams*	*Spring and summer*
FORBS:			
Common lespedeza	*Scattered*	*Roadsides, pastures on all except wet sites*	*Spring through early fall*
Swamp sunflower	*Common*	*Moist sites*	*Spring through fall*
Tickclover	*Scattered*	*All except wet sites*	*Summer through fall*
BROWSE:			
Blackgum	*Abundant*	*Moist to dry soils*	*Spring and summer*
Dahoon	*Common*	*Sandy acid soils*	*Fall and winter*
Elliott blueberry	*Scattered*	*Acid soils*	*Winter*
Greenbriers	*Common*	*Moist to dry sandy soils*	*Winter and early spring*
Saw-palmetto	*Abundant South Carolina to Florida and Louisiana*	*Sandy ridges to swamps*	*All year*
Summersweet clethra	*Scattered*	*Margins of waterways and swamps*	*Spring and late fall*
Swamp cyrilla	*Common*	*Margins of waterways and swamps*	*Spring and late fall*
Yaupon	*Common*	*Moist to dry sites. Prefers sandy soils with permeable subsoil.*	*Fall and winter*

Except when specific states are mentioned, the species are found throughout the southern pine forests.

Some 15 to 20 grasses normally make up 80 to 90 percent of the cattle diet on southern pine ranges. Forage management is usually based on information about a few prevalent and important species. The more important ones in the southern pine type are:

Bluestem and associated Grasses.—Slender bluestem furnishes best grazing in spring, and with moderate to heavy grazing, remains productive during summer. On open forest land where slender bluestems predominates, annual yields may approach 2,000 pounds per acre. Bluestem is intolerant of shade. If unburned or ungrazed, it becomes unpalatable, and the wiry stems and seed stalks build up a "rough" condition which hinders grazing and lowers forage yields. A burning cycle of 3 to 4 years is appropriate for removing litter and top growth and keeping this plant productive. Pinehill bluestem withstands moderate grazing and prescribed burning, but close, repeated grazing and frequent fires are detrimental.

Pinehill grows well beneath trees, unless retarded by accumulations of leaf litter. If there is no danger of damaging young pines or other resources, yearlong grazing may be practical where pinehill bluestem and other tall-growing bunchgrasses are the main source of fall and winter forage.

Slender and pinehill bluestem often grow in mixed stands in the Gulf Coastal Plain and cannot be managed separately. Efforts should be made to lessen the grazing intensity on pinehill bluestem by burning less frequently than on areas where slender bluestem predominates.

Other tall-growing bunchgrasses, such as big and little bluestem and switchgrass, respond to management much the same as pinehill bluestem. They will tolerate winter burns, but an inability to withstand close grazing accounts for their relative scarcity throughout the coastal plain.

Recommended utilization for the bluestem type is about 40 to 50 percent of the foliage of the predominant grass species.

Pineland Threeawn and Associated Grasses.—Pineland threeawn is a bunch-grass with long wiry leaves. It furnishes best grazing in spring after burning. Cattle should be kept off midwinter burns until the grass is 6 to 8 inches tall. Otherwise cows may not find enough to eat, and close grazing will damage the associated forage plants. Permit cattle to remove 40 to 50 percent of the foliage. Blades of pineland threeawn pull from the plant so easily and inconspicuously that very careful observation is required to determine the degree of grazing. As the grass matures, it becomes less palatable and nutritious, and much of the foliage remains ungrazed.

Unburned, pineland threeawn is grazed very little and the main diet of cattle becomes other warm-season grasses. To protect these grasses during early growth, grazing could be delayed until early summer and the acreage allowed per cow adjusted according to yields.

Curtiss dropseed grows as dense tufts or small bunches in close association with pineland threeawn. It thrives with frequent burning but is not easily smothered by dead herbage and forest litter. If ungrazed, it tends to increase with continued fire protection. It remains conspicuously green in winter and attracts cattle after other grasses mature. When abundant, Curtiss dropseed furnishes more forage and is grazed more heavily than any other grass during the fall and winter. On moderately stocked ranges, it is grazed sparingly in summer; heavy use signifies a definite scarcity of palatable herbage. As with pineland threeawn, light grazing is difficult to detect.

Creeping bluestem grows as single stems or as very small and scattered tufts. Its slender underground stems distinguish it from other bluestems. New leaves and regrowth are grazed readily in summer, and young seedstalks are preferred forage in late summer. Creeping bluestem withstands moderate grazing, but declines if heavily grazed.

Lopside indiangrass is so named because of the long-awned seeds hanging from one side of the panicle. Leaves are eaten in the spring and summer, and emerging flower stalks are eaten in late summer and fall even where a wide variety of other forage, including improved pasture, is available. This bunchgrass persists with light grazing, but decreases when grazed closely. Though it tolerates frequent fires, it also grows well on unburned ranges.

Carpetgrass and Panicums.—Carpetgrass and panicums occur throughout southern pine forests. Carpetgrass withstands heavy grazing better than most native species because it forms a sod. It is abundant only where grazing is frequent and close. It is often seeded on grazed firebreaks.

Two general types of panicums are easily recognizable in longleaf and slash pine forests. One has three distinct seasonal growth phases. In winter these plants form a ground-hugging rosette of green leaves that are valuable in cattle diet when other forage is scarce. In spring, the plants send up leafy but unbranched flower stalks with prominent panicles that are relished by cattle as long as these plants are succulent and tender.

Panicums of the second general type bloom only in late summer or fall and do not form rosettes. Switchgrass, the most important member of this group, decreases with heavy grazing. When ungrazed and found in large enough patches, switchgrass may be cut for hay.

Maidencane is one of the most palatable panicums. Underground stems produce a heavy growth of leafy shoots that emerge in early winter and become 3 to 5 feet tall, providing excellent winter forage. In mild years, the foliage may stay green all winter.

Range Improvements

On many southern forest ranges, growth of both forage and timber is hampered by weedy plants. The most troublesome are gallberry, saw-palmetto, southern waxmyrtle, and various species of scrub hardwoods.

Gallberry and saw-palmetto are most prevalent in the flatwoods of Florida and south Georgia, while southern waxmyrtle is common in pinelands throughout the South. Although used by wildlife and cattle as food, these plants restrict the growth of more desirable forage species.

Prescribed burns at intervals of 3 to 4 years keep gallberry, southern waxmyrtle, and saw-palmetto in check, but rootstocks survive and soon send up new shoots. Unfortunately, results from application of approved herbicides to control both saw-palmetto and gallberry have not been consistent nor proven economical. Bulldozers and rootrakes are commonly used to clear saw-palmetto lands for improved pastures, and roller chopping to control saw-palmetto has become a common range improvement practice. Chopping, combined with a rest-period during the first growing season following treatment, has been effective in converting range domination by pineland threeawn to domination by bluestems, primarily creeping bluestem (figure 9). Cross-chopping (the second treatment at right-angle to the first) has proven very effective in killing saw-palmetto, pineland threeawn, and scrub hardwoods, and greatly reducing gallberry.

FIGURE 9. — Chopping, combined with a rest period during the first growing season following treatment, is effective in converting range from domination by pineland threeawn to domination primarily by creeping bluestem.

Scrub oaks and other poor-quality hardwoods can be killed by injecting an approved herbicide into the tree or applying the herbicide to frills or girdles made with an ax. Broad-scale spraying of herbicides is not generally recommended in good timber-producing areas because valuable commercial hardwoods are also likely to be killed or damaged. Any control program using herbicides should be critically evaluated and closely monitored and label instructions carefully followed to minimize harmful side effects on other plants, wildlife, and humans.

Deadening unwanted hardwoods and precommercially thinning pines may increase grass yields considerably. In central Louisiana, bluestem forage averaged 2,400 pounds (air-dry) per acre on plots where blackjack and post oaks were killed 2 years previously; untreated plots contained 680 pounds. Grasses on treated plots were higher in crude protein and phosphorus than those on untreated plots. Grass production remained high for several years, and then gradually declined, as shade increased from pines planted when the hardwoods were killed.

Range and Pasture Combinations

Range and improved pastures are dependable sources of yearlong forage when used together. Combinations are especially suitable for cattle owners who have neither sufficient range nor improved pasture to support herds of practical size—25 head or more. Forage from improved pastures is higher in crude protein and minerals than most native forage. Such pastures improve the condition of cattle, and thus better the calf crop.

Pasture Species.—Coastal bermuda grass and dallisgrass grow well in much of the South. Pangolagrass is very productive in south Florida. Pensacola bahia does well in the southernmost coastal areas and is very shade tolerant. Overseeding pastures with lespedeza and white clover increases yields, extends the grazing period, and contributes to soil nitrogen. To be successful, pastures must be liberally fertilized. Recommendations for species and scheduled fertilization for specific soils, sites, rainfall, and temperatures are best obtained through the local agricultural extension agent or specialists of the Soil Conservation Service.

Livestock Distribution and Grazing Schedules.—To facilitate management, ranges should be separated from improved pastures by fences whenever possible. Cattle can then be confined to the range or pasture, as needed, to get the desired use in

each unit. To assure regeneration, grazing pressure on pasture legumes must be light while these plants are flowering and seeding.

During spring and early summer, native forage should be grazed and some forage from improved pastures should be cut for hay. One or two crops can be harvested each year. The hay from 1 acre (1.0 to 1.5 tons) is ample to feed a cow in drylot for 3 to 4 months.

One-half to one acre of moderately fertilized pasture in combination with 10 to 20 acres of range will usually produce enough forage and hay to care for a cow all year. The ratio of pasture to range varies widely by areas and operations. In many parts of the longleaf-slash pine forest type, improved pasture is the major source of forage, with native forage contributing less than half during the growing season and small amounts in winter. The following schedule for grazing and feeding cattle and harvesting hay is generally applicable to southern pine types other than south Florida:

Mar.-Apr.	May-July	Aug.-Oct.	Nov.-Feb.
Graze improved pasture or pasture-range combination	Graze range; harvest pasture for hay	Allow cattle free access to both range and pasture	Graze crop residue and or feed hay in drylot; lightly graze range or winter grains as available

In a south Georgia research study, cows were allowed free access during March to October to 0.6 acre of improved pasture and 20 acres of range. Half of the range was burned annually to give cattle 10 acres of fresh burn each year. Cattle grazed on crop residues until December and fed hay in drylot during the winter maintained their weights during the year. A 90 percent calf crop was produced, and weaned calves weighed 475 pounds.

In south Florida drylot feeding may be unnecessary. In one operation, four 20-acre pasture units of pangola, Pensacola bahia-indigo, Pensacola bahia-hubamclover, and Coastal bermuda were grazed one at a time in rotation. At the same time cows had free access to 320 acres of native forage, 160 acres of which was burned each year—80 in early December and 80 in late January. The cattle obtained 30 to 40 percent of their feed from the native range. The combination supported 65 cows that produced 80 percent calf crops and weaned calves weighing 425 pounds.

In another south Florida operation, cows had free access to pasture and range, except for 2 to 3 months in winter, when they were excluded from the pasture to permit growth of white clover. The range was burned in late fall to provide green forage for winter. Cows were turned back into pasture in late winter and early spring to take advantage of the luxuriant clover during the breeding season. One acre of improved pasture replaced about 10 acres of range.

Grazed Firebreaks.—These are strips of improved pasture that serve as barriers to fire. They not only produce good forage for most of the year, but also improve the distribution of cattle over the range.

Firebreaks should be located to take advantage of natural barriers to fire and provide a route of travel for firefighting crews and equipment. Avoid sites too wet or dry for good forage plant growth. Ordinarily, breaks will divide the forest into units of 40 to 320 acres. A uniform strip width of about 65 feet is preferable, with 16 feet a minimum (figure 10).

Firebreaks should be cleared of woody plants and shrubs, seeded to appropriate mixtures of grasses and legumes, and fertilized and limed according to plant and soil requirements. If they are to be good fire-stoppers, firebreaks must be kept clean by grazing, mowing, and weed control.

FIGURE 10. — A uniform firebreak width of 65 feet is preferable; 16 feet is a minimum.

If winter annual grasses are seeded into the summer-grass sod, grazing should begin when the annuals are 6 to 8 inches high. This will usually occur in late December or early January, but can happen by early November. Moderate to heavy grazing should continue through spring and summer until winter annuals are seeded in the fall. Cattle should be excluded until seeded grasses are again available for grazing. If winter grasses are not planted, the grazing season will normally extend from late March to October or early frost. Firebreaks can be stocked for the entire grazing season at rates of 3/4 to 1 acre per mature cow.

SELECTION AND MANAGEMENT OF CATTLE

General Principles

The selection of good quality livestock to utilize forest range grazing is critical to a successful operation. Since the objective is to produce beef as economically as possible, livestock suited to the local

climate, forest forage, and other conditions should be used. A good selection is those animals possessing some Brahman blood. Mothering qualities, foraging ability, hardiness and adaptability to the warm climate are inherent to the species, making Brahman and Brahman crosses a good choice for the area. In addition, crosses with dairy and British beef breeds are beneficial. A good cow for use on southern pine ranges might be one-half Brahman, one-fourth British, and one-fourth some type of dairy breed. When bred to British bulls, such cows produce calves that are vigorous and gain weight well.

Forest range grazing operations depend on cash obtained from selling weaned calves produced on the range. Therefore, it is very important to produce the largest possible calf crops. Continual effort is needed to better the herd. Cows on a fairly high maintenance level should calve at least 3 out of 4 years, with calves weighing more than 400 pounds at 6 to 8 months of age. Cows failing to meet these standards should be replaced. When the condition of cows is poor, accurate culling is difficult because undernourished cows often will not conceive while suckling a calf. Heifers from high-producing cows or from herds of known production should be selected as replacements. Larger than average heifers from bred-up stock, containing some Brahman blood, are preferable.

Heifers should be 2 years old when first bred. If bred as yearlings, they are more apt to have calving problems and less likely to have a calf the following year.

Fast-growing bulls raised largely on roughage are desirable, regardless of the breed chosen. Performance-rated purebreds are best, if available. It is wise to test bulls for fertility before putting them with the herd. Good bulls should be retained until their breeding efficiency declines or until inbreeding with their progeny becomes a problem. Normally, they will be rotated or replaced every 3 to 4 years.

Cows should be kept as long as they consistently wean heavy calves. Well nourished range cows do not seriously decline in productivity until they are at least 10 to 12 years old. Cattle may have difficulty adjusting to an unfamiliar type of forest range. When new cattle are stocked, some animals in each herd should have familiarity with the native range situation. Otherwise, new cattle may not learn to utilize the native forage until they have lost excessive weight or even damaged themselves by eating toxic vegetation. These cattle learn from experienced animals how to select usable forage and to avoid toxic plants, such as bracken fern.

Breeding Season

The breeding season for cattle on forest range should be limited to about 3 months, so that calves can be weaned and marketed at one time. When calves are dropped throughout the year, extra time and money are required to raise them, and the feeding and grazing schedule of cows may be more complicated.

If a cow does not breed within 3 or 4 months, during which time she will normally come into estrus 4 or 5 times, chances are high that she would not breed that year. Even if she did conceive, the calf would wean at a low weight and need special handling.

Generally mild temperatures in the south permit calving during the winter, whether cattle are in feedlot or on the range. Having bulls with the cow herd from late February through May or June results in calves dropped in the winter and no later than March. Calves are then old enough to take advantage of the lush spring grass and high milk production (lactation) period. Calves can gain an average of 2 pounds per day until weaning in August. In areas such as south Florida, the breeding season may need adjusting due to the different vegetation production and rainfall cycles.

Supplemental Feeding

Range forage must be supplemented if cattle are to thrive. Without supplements, cattle are highly susceptible to parasites, disease is high, and malnutrition causes heavy death losses. Average calving percents seldom exceed 50 percent, with weaned calves frequently weighing less than 300 pounds.

Supplemental feeds raise calving percentages to around 80 percent and weaned calf weights to 400 pounds or more. Late fall and winter are crucial for supplemental feeding (figure 11). Improved pasture and pastured firebreaks, discussed elsewhere in this publication, can serve as sources of supplementation, especially if winter-hardy clovers, ryegrass, and other cool-season species are used.

Protein Concentrates. — Cottonseed meal or pellets are a widely used and practical protein concentrate. The meal should be placed in troughs, while pellets can be scattered on the ground without excessive loss. Supplemental feeding usually starts in October or November, but it should begin earlier if cows show signs of losing weight rapidly. During the fall, 1 to 2 pounds per animal per day will be sufficient, but when cows remain on the range during winter the rate should be increased to 3 pounds per day. About 375 pounds per animal each

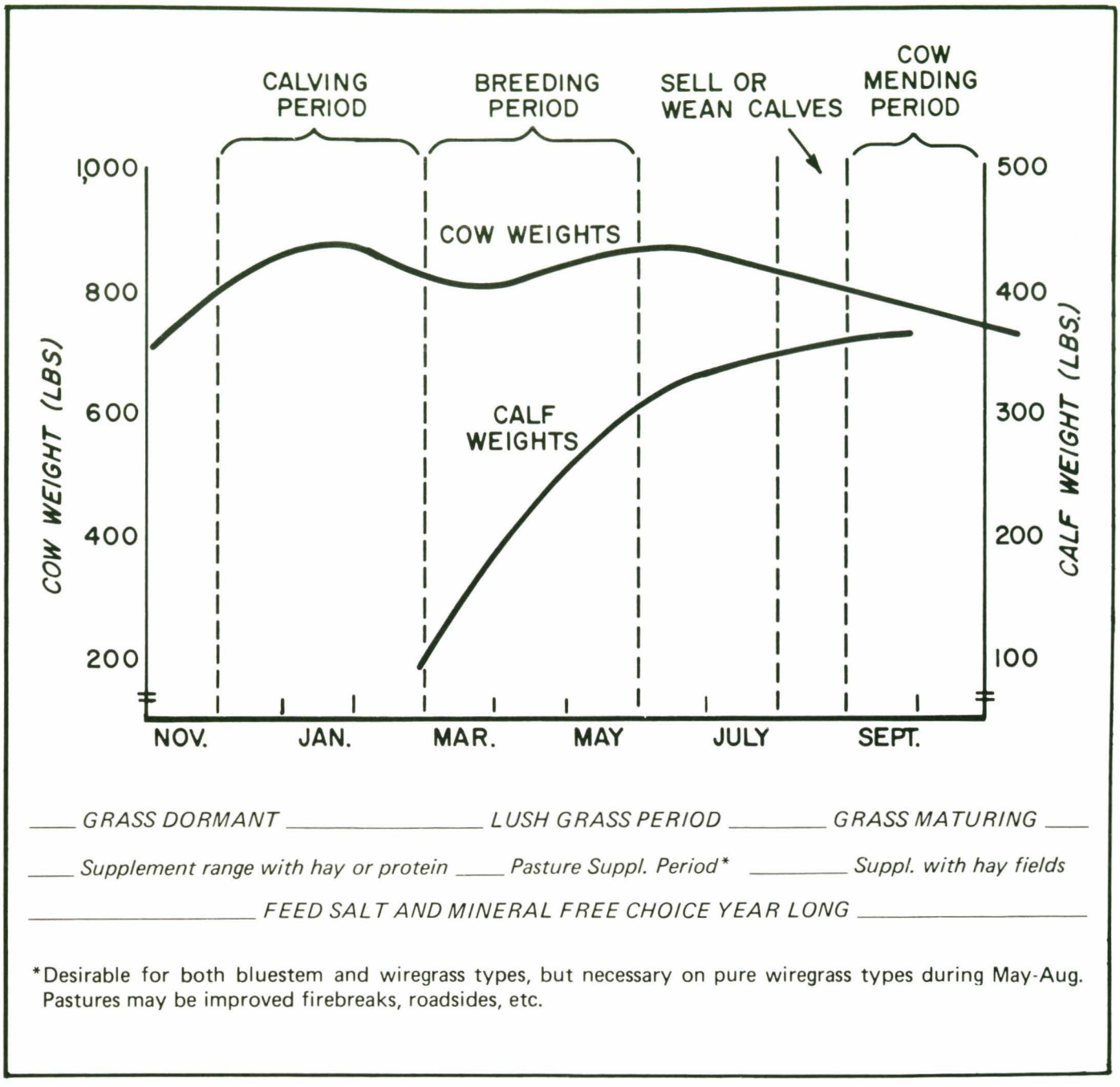

FIGURE 11. — Expected weight gains for a cow-calf operation on managed southern forest lands using supplemental feeding.

year is enough on most ranges. Due to labor costs, feeding protein concentrates during the spring and early summer has not proved practical. Use of self-fed liquid supplements containing urea and molasses may make this practice more feasible. Improved winter pasture can also supply the protein needed. Supplemental feeding may stop after forage turns green in spring.

Phosphorus, Calcium and Salt. — These minerals should be accessible in feed-boxes all year. Steamed bonemeal (32 percent calcium, 15 percent phosphorus) is most widely used, with apparently good results. Two parts of meal are often mixed with one part of salt to induce consumption and prevent spoilage. Yearly consumption of this mineral mix varies from 18 to 75 pounds per head depending on the weather, quality of forage, and mineral content of other feeds. If a greater intake is desired, molasses or cottonseed meal can be added to increase palatability. Salt can be supplied separately from other minerals if desired.

Minor Mineral Elements.—Minor elements are often added to mineral mixtures as a precaution, but the only area of demonstrated need is south Florida. Mixtures suitable to this area contain red oxide of iron (3.12 percent), copper sulfate (0.63 percent) and cobalt chloride or cobalt sulfate (0.04 percent).

Cattle Handling Facilities

In the past, most forest ranges were unfenced, and cattle roamed at will. Following recommended feeding and breeding practices was difficult. Now, most states require livestock to be fenced from highways. Although this adds to the cost of grazing, fences permit a landowner to have greater management control of livestock and range.

A four-strand barbed-wire fence, with posts set 30 to 40 feet apart and 2 to 3 stays between posts, is suggested for cattle. However, a three-strand fence is generally adequate for interior cross-fences. A woven-wire fence is essential if the forest owner needs to exclude hogs.

Many southern forest ranges have live streams, but frequently stockwatering facilities are needed to provide permanent water and regulate livestock distribution. Ponds are usually the cheapest form of construction, but in droughts they are less dependable than wells.

Cattle are generally rounded up regularly for spraying, castrating, weaning, branding, and observing. Board corrals, 6 feet high and with two or more separate pens, greatly facilitate cattle handling. The posts and boards should be treated with preservatives.

ECONOMIC CONSIDERATIONS

One of the simplest, but most overlooked, ways of making more money from livestock operation is through sound cattle management. The traditional uncontrolled and unmanaged herd of cattle ranging the woods produced little income but was justified by many because of the low expense involved. Today however, a marginal operation can be turned into a profitable one by controlling the animals' use of various forages, regulating their breeding, and improving their quality. These practices entail some additional expense and time but produce a substantial return on the investment.

A basic objective of the livestock operator is to produce beef and derive a profit. It costs about the same to support a cow for a year, whether or not a calf is produced. Nonproductive cows frequently mean the difference between profit and loss. Therefore, herds should be heavily culled to replace the low-producers with better cows.

One analysis has shown that incorporating livestock grazing into a pine timber management operation yielded a 17 percent internal rate of return on investments. Profits depend greatly on the cost of items purchased and the sale price of cattle. Highest returns per cow are generally obtained from lightly grazed range; greatest returns per acre come from heavily grazed range. A moderately grazed range, however, provides the greatest financial benefits in the long run. This also offers the least conflicts with many other resource uses without the danger of destroying the forage resource.

Costs and Returns

Several factors must be considered in determining economic feasibility of combined timber and beef production operations. These costs and returns can be grouped into single and recurring payment categories and sales.

Single Payment Expenses.—These usually come early in the stage of new business enterprises and are critical, both from the standpoint of present and future production capabilities and profit margin. Here are some examples:

1. Planning for coordination of timber and livestock management is more complex and may require additional time and money.
2. Site preparation for tree planting or natural regeneration can be modified to accommodate forage production objectives. These modifications may cost extra, either in terms of actual dollar outlay or foregone timber or wildlife production.
3. Additional land may be needed for improved pasture, or land already owned might be converted to improved pasture.
4. Fences, corrals, chutes, water tanks, and feed bunks are necessary items in a beef cattle operation. If additional fences are needed to protect or facilitate management of timber, wildlife, recreation, or other improvements, plan to provide these in the initial investment.
5. Additional new roads for management of livestock and timber may be necessary.
6. An initial purchase of livestock is necessary, unless the owner already has cattle.
7. Truck, tractor, and other equipment needs must be met.

Some of the above-listed expenses may be unnecessary, depending on the past use and condition of land being considered for management. For example, old fences and corrals can frequently be rehabilitated, water may be available from streams or lakes, and roads may only need to be improved. Initial investments are a critical part of any operation and should be examined carefully regarding need and expected future income.

Recurring Expenses. – Some expenses that recur frequently or annually are:

1. Salt, other minerals, hay, and other supplements to range forage.
2. Forage surveys, coordinated planning of timber-range activities, and general management duties, should be quantified as to dollar cost and be included.
3. Facilities maintenance.
4. Sales commissions and hauling.
5. Pasture fertilization and maintenance.

Returns. – Some investor-related returns that can be expected from a timber and beef cattle operation are:

1. Annual sale of calves and cull cows.
2. Periodic sale of cull bulls.
3. Annual sale of surplus hay.

Although costs increase when both timber and forage are managed on the same land, mutual benefits for timber, forage, and wildlife can be achieved. When important to the landowner, these benefits should be considered in evaluating the feasibility of an operation.

COORDINATION WITH OTHER USES

Timber Management

Forage production in southern pine forests varies greatly with the type, density, and structure of timber stands. Consequently, coordination of timber, wildlife, and forage management planning is necessary for best results. Pine trees with a few mixed hardwoods usually make up the overstory of southern pine stands. However, some stands are dominated by overstory hardwoods or have dense mid-stories of sweetgum, blackgum, oak, dogwood and other shade-tolerant trees and shrubs. These produce little forage. Most of the desirable forage species need sunlight for best growth. Therefore, the structure of the overstory and mid story determines, to a great extent, how much forage will be produced.

Timber management practices are usually planned and conducted on the basis of stands (groups or areas of similar trees). The size and delineation of stands will vary, depending on the owner's objectives, the condition and type of tree cover, the physical character of the land, and local timber markets. Much of the southern pine area is managed as even-aged stands, (dominant trees of the same general age).

Since timber prescriptions are made by stands, recommendations for coordination of forage production with timber and wildlife management should also be made on this basis. Here are some considerations for protecting or improving the range resource during stages of stand development beginning with the seedling stage:

1. Whether pine seedlings are planted, the area is seeded, or existing natural regeneration is present, seedling density should be kept to the minimum needed to meet the owner's timber and forage production objectives. Wide spacings – 8 x 12 feet or greater – allow higher production of grass for a longer period of time (figure 12). Although cattle do not prefer trees over grass as food, they may damage young tree seedlings if not managed properly. However, recent research as shown that slash pine can withstand considerable injury with little detriment to subsequent growth.

FIGURE 12. – Wide tree row spacings will allow higher production of grass for a longer period of time.

While trees are less than 1 to 3 feet tall, cattle stocking could be reduced to half the normal number, and the area should not be grazed in the winter months. Thereafter, cattle numbers should be determined by measurements of forage production. Some tree damage can be expected around watering and feeding areas. Otherwise, livestock use should complement timber production by reducing fuels which contribute to destructive wildfire.

On naturally seeded or regenerated areas, there are frequently more seedlings than needed for timber production purposes. Seedlings should be thinned to leave only 500 to 550 well-spaced, healthy stems per acre. Thinning, which can be done by hand, drum chopper, bushhog, or other means suitable to the area, will benefit both forage and tree growth.

If areas must be site prepared before planting trees, several inexpensive methods can be used to enhance grass establishment and growth. Here are some general guidelines for selecting the best meth-

od for a given area:

a. On areas where timber is being harvested, remove as much of the woody material as possible. This practice lessens the cost of site preparation for a future crop of trees and helps grass growth. Use site preparation methods that do not drastically disturb the roots of existing grasses.

b. Where oak, hickory, and other hardwood sprouts occur, summer prescribed burning or light chopping with a drum chopper is best for future forage production.

c. If gallberry and palmetto are present, prescribe burn in the winter, then follow with single or double chopping in the late-spring or early summer.

d. Where grasses are not already established, wait one year before stocking with cattle. This period allows newly germinated grass seed to grow into mature plants before grazing occurs.

2. As trees grow taller into the sapling, young pole, or young sawtimber stages, grass production decreases because of increased shading by live tree crowns and pine needle accumulation on the forest floor. Trees should be thinned as early as possible and as heavily as timber and forage management objectives permit (figure 13). To allow for best grass production after each thinning, leave no more than 70 square feet per acre of tree basal area. Timber objectives may justify a denser stand of trees, but cattle production can help compensate for possible timber-growth losses. For example, cattle can reduce fuel accumulation, subsequently preventing destructive wildfires. The sale of beef or the leasing of grazing privileges may also compensate for reduced timber income.

Prescribed burning and light drum chopping between tree rows will consume or break up competing vegetation such as sprouts, needles, vines, etc. Chopping may attract tree damaging insects, however, if not done properly.

3. During the mature sawtimber stage, management practices must be applied that will help establish a desirable new generation of trees. If a shelterwood or seed-tree cut is made to obtain tree reproduction, cattle should be withdrawn or drastically reduced in number to permit the establishment of new seedlings. This establishment can be enhanced by heavy grazing prior to cutting and seedfall to reduce ground cover and vegetative competition. Plans must be made prior to harvest to provide other areas where livestock may graze until tree seedlings are well established. Sale contracts or agreements should include provision for protection of fences and other improvements during timber harvest. If selective cutting is used to

FIGURE 13. — Trees were thinned at age 10 in this 80-acre slashpine-bahiagrass pasture.

obtain regeneration, cattle stocking should be permanently adjusted to allow successful seedling establishment between cuts. As cuts and prescribed burns are made, grass production will increase. Livestock will tend to concentrate in openings created for tree reproduction, but proper cattle stocking can be achieved by carefully observing livestock use of grasses in these small openings. If use is at 60 percent or less of the available forage, the area should regenerate if adequate seed trees and moisture are available and other competing vegetation is controlled. Fire lines and access roads could be seeded and fertilized to provide supplemental grazing.

4. The management of improved, shade tolerant grasses in tree plantations, is an alternative example of intensive integrated timber and pasture management (figure 14). Grasses are fertilized and maintained to provide maximum production in a stand of pine trees. Fertilization benefits both trees and grasses, as does prescribed burning in later years. Bahiagrass has been the most commonly used grass for this purpose. It persists in pine plantations for over 25 years and when released by fire or timber harvesting, responds by covering the forest floor (figure 15). The advantages offered by this system are:

a. The owner has an annual income from livestock and a periodic income from timber.

b. Fertilizer usually benefits both timber and grass.

c. Needs for improved pasture grasses can often be met without sacrificing timber production.

d. Forest fuels are greatly reduced, and timber damage from wildfire is minimized.

e. Site preparation costs for tree planting vary greatly, but would be much less under this system than on areas where hardwood trees and sprouts occupy the site.

Some of the disadvantages are:

a. Management of both timber and cattle requires greater expertise and more coordination of management practices.

b. Insects and diseases may be more likely to damage trees since fertilization may cause young trees to grow at rates which make them more susceptible to insects and diseases.

c. Initially, some additional investment is needed for site preparation, grass establishment and maintenance, and extra fencing.

The time to plan for this intensive type of management is prior to the final harvest of timber. Since all of the forage production area will probably not be treated in this manner, the manager must look for the areas with the most suitable soils and where best overall use of the forage can be obtained. These areas should be defined prior to harvest so that harvesting methods can be modified where

FIGURE 14. — This seven-year-old pine plantation was divided into two portions one year after establishment of bahiagrass and slashpine. The upper photo shows the ungrazed area, while the lower photo shows the area that was grazed and fertilized from the time trees were 18 months old.

FIGURE 15. — Bahiagrass has persisted in this pine plantation for over 25 years.

needed to help prepare the site for grasses. Some owners have planted melons for a year or two following site preparation to help eliminate woody sprouts and other competing vegetation before planting of trees and grass.

Wildlife Management

Coordination requirements will depend on the species of wildlife featured by the owner. Advance planning and coordination of both timber and grass production activities by landowners can also produce more wildlife for personal enjoyment and recreation. White-tailed deer, eastern wild turkey, and bobwhite quail will usually benefit from conditions created by moderate livestock use and coordinated management.

Wildlife needs a variety of food and cover conditions. Range and timber management plans should provide for the management and protection of desired conditions for wildlife cover and food. Properly grazed areas provide, at little or no extra cost, the habitat diversity needed by some species, as well as easier access for hunters and better conditions for visual observation.

Landowners and operators who lease or otherwise allow hunting on their properties used for cattle management should seriously weigh benefits against potential livestock losses incurred due to hunting. For example, gates left open allow livestock access to roads. Potential damage from loose livestock and from hunters' guns should be weighed against forage values in deciding whether or not to utilize native forage during the hunting season.

Prescribed burning and site preparation activities should be avoided during nesting seasons for quail and turkey. Livestock water holes can also be used by wildlife if constructed with dual purposes in mind.

Wildlife such as the grey squirrel and several species of woodpecker require hardwoods and do not thrive in pine stands. However, when available next to hardwoods, pine areas will be used by many wildlife species, especially if proper timber management coordination is provided. Small improved pastures located throughout the forest will often add the habitat diversity needed to increase the variety of animal or bird species in the area. Both turkey and quail need open areas for nesting and rearing young birds. Insects found only in grasses and weeds provide the food for many other bird species.

Soil and Water Management

Livestock can cause soil erosion and eventual stream pollution. Management activities and stocking rates should consider the type of soil, steepness of the land, vegetation on the land, and the amount and type of rainfall. Bare soil, when exposed to raindrop impact, will erode and possibly be transported into streams. Where serious erosion is likely to take place, the owner or operator should consider several management practices:

— Fence and exclude livestock from bare or eroding areas until the erosion hazard is ended. Revegetate and stabilize these areas with grasses, trees, or both.

— Delineate and manage vegetation in streamside zones to serve as sediment filter strips for water moving into the stream. These strips can also produce timber, wildlife habitat, and some forage while serving a pollution control function.

— Control livestock access to highly erodable stream banks and wet areas.

— Confine cattle feeding and other concentration activities to level areas. Relocate, as needed, to prevent soil compaction.

Other Values

Other values, such as scenic beauty, can also be enhanced by forage management. Openings or small pastures can serve as scenic vistas and provide pleasant diversity to an otherwise monotonous landscape. Some aesthetically desirable plants, however, may be damaged by grazing. This is particularly true with low plants in moist areas or

plants that are eaten by cattle. Proper stocking and good forage management can help minimize this damage.

SUMMARY OF RECOMMENDATIONS

Learn to recognize the main forage plants on the range. Grasses such as slender, pinehill, and creeping bluestem, pineland threeawn, and Curtiss dropseed are most prevalent, but other grasses, forbs, and evergreen browse are important in adding variety to the cattle diet. For information on identification and growth habits of range plants, consult specialists from state experiment stations and from the USDA's Forest Service, Soil Conservation Service, and Extension Service.

Graze the range moderately to get the best balance between cattle gains per acre and per head.

Fully consider all forest uses before making prescribed burns. Generally exclude fires until trees are at least 8 to 10 feet tall. Thereafter, prescribe-burn at 2- to 5-year intervals to improve forage, remove litter, reduce wildfire hazard, and control undesirable plants.

Thin trees regularly, first when they average 6 inches in d.b.h. (diameter at breast height) and thereafter at about 5-year intervals.

Avoid damage to pine seedlings by grazing the range lightly to moderately or excluding cattle from the range during winter and spring until sufficient forage is produced.

To provide year-long forage, develop improved pastures to supplement forest range. Cut pasture grass in spring and early summer and store it as hay to be fed in winter; 1 to 1.5 tons per cow is enough. Consider establishing improved pastures as firebreak strips through the forest.

Fence the lands to be grazed. If range is being leased, have a written agreement.

On forested range, cattle must be fed supplements such as: cottonseed cake or meal (crude protein) in fall and winter or liquid supplements in summer, fall and winter; steamed bonemeal (phosphorus and calcium) and salt (free-choice) yearlong; iron, cobalt, and copper all year in south and central Florida.

Maintain some Brahman blood in dams. Breed them to tested bulls of British breeds. Rotate or replace bulls every 3 to 4 years.

Restrict the breeding season to about 3 months, so that calves born in winter can take advantage of good forage and the cow's maximum milk flow in the spring.

Wean and market calves in late summer.

Cull cows that fail to raise a 400-pound calf three years out of four. Select replacements from high-producing dams.

Maintain a practical balance among cattle, forage, and trees. Do not go overboard in one resource and neglect another.

COMMON AND SCIENTIFIC NAMES OF PLANTS

Grasses

Big bluestem (Andropogon gerardii)
Carpetgrass (Axonopus affinis)
Coastal bermudagrass (Cynodon dactylon)
Creeping bluestem (Schizachyrium stoloniferum)
Cutthroatgrass (Panicum abscissum)
Curtiss dropseed (Sporobolus curtissii)
Dallisgrass (Paspalum dilatatum)
Goobergrass (Amphicarpum muhlenbergianum)
Giant cane (Arundinaria gigantea)
Little bluestem (Schizachyrium scoparium)
Lopside indiangrass (Sorghastrum secundum)
Maidencane (Panicum hemitomon)
Pangolagrass (Digitaria decumbens)
Panicum (Panicum spp.)
Pensacola bahiagrass (Paspalum notatum)
Pinehill bluestem (Schizachyrium scoparium var. divergens)
Pineland threeawn or Wiregrass (Aristida stricta)
Pineywoods dropseed (Sporobolus junceus)
Ryegrass (Lolium perenne)
Slender bluestem (Schizachyrium tenerum)
Spikegrass (Chasmanthium spp.)
Switchgrass (Panicum virgatum)
Threeawn (Aristida spp.)
Uniola (Chasmanthium spp.)
Yellow indiangrass (Sorghastrum nutans)

Forbs

Common lespedeza (Lespedeza striata)
Hairy indigo (Indigofera hirsuta)
Hubam clover (Melilotus alba)
Lespedeza (Lespedeza spp.)
Swamp sunflower (Helianthus angustifolius)
Tickclover (Desmodium spp.)
White clover (Trifolium repens)

Shrubs

Alabama supplejack (Berchemia scandens)
American beautyberry (Callicarpa americana)
Blueberries (Vaccinium spp.)
Brambles (Rubus spp.)
Dahoon (Ilex cassine)
Elliott blueberry (Vaccinium elliottii)
Gallberry (Ilex glabra)
Hawthorns (Crataegus spp.)
Saw-palmetto (Serenoa repens)
Southern waxmyrtle (Myrica cerifera)
Summersweet clethra (Clethra alnifolia)
Swamp cyrilla (Cyrilla racemiflora)
Yaupon (Ilex vomitoria)

Trees

Blackgum (Nyssa sylvatica)
Blackjack oak (Quercus marilandica)
Beech (Fagus spp.)
Dogwood (Cornus spp.)
Eastern redcedar (juniperus virginiana)
Hickory (Carya spp.)
Maple (Acer spp.)
Oak (Quercus spp.)
Post oak (Q. stellata)
Sassafras (Sassafras albidum)
Sweetgum (Liquidambar styraciflua)